NASA Procedural Requirements

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Subject: Technical Probabilistic Risk Assessment (PRA) Procedures for Safety and Mission Success for NASA Programs and Projects

Responsible Office: Office of Safety and Mission Assurance

Appendix C. Comments on PRA Scope

C.1 PRA is used to evaluate the risk associated with various alternatives, reference mission concepts, and feasibility studies. Prior to SDR/MDR, the program hardware and mission are in concept development, and the PRA to support program/project implementation may consist of simplified models and be used to gain top level risk insights on the various alternatives.

C.2 When a specific mission concept and architecture are selected and the system requirements defined, the values of the end states or performance metrics determined by the risk assessment provide input to establishing the safety, health, and technical performance requirements for the mission.

C.3 Design generally involves the development of technologically feasible configurations that meet functionality and performance requirements and seek options that best satisfy constraints while minimizing costs and risk to acceptable levels. The PRA that supports the activities leading to CDR may initially consist of high-level and simplified models but with more detail and fidelity for conducting design trade-offs eventually leading to a final design. As the design progresses, the PRA is also refined where more detailed studies are conducted. When the design is ready for fabrication, the PRA is updated to reflect the as-built configuration. From a design standpoint, the maturity, architecture, systems, and assemblies are included in the PRA model for all end states specified in the program/project objectives. The results of this PRA can be compared to established performance requirements and expected operations and to identify margins. The results can also be used to identify critical components (dominant contributors) that may require special attention during fabrication and assembly. Completeness of scenarios is an

important consideration of a PRA that supports this life-cycle phase. Uncertainty analysis is performed to provide the decision-maker with a full appreciation of the overall degree of uncertainty about the PRA results and an understanding of which sources of uncertainty are critical to the results that guide decisions.

C.4 The PRA that supports activities leading to ORR/FRR needs to be complete and full scope and reflect the as-built end product. This PRA is used to conduct operations studies and mission profile analyses. A PRA performed prior to operation can serve to predict impacts to the program that could be detrimental to success. Thus, given that the design is acceptable from a safety and health perspective, a PRA for operations can focus on those aspects of risk that relate to system operability and maintenance and the performance of the mission. Risk importance measures determined by the PRA can be used to optimize procedures and resource allocations during operation.

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